

NC Innovation Index & Next Generation Power Electronics Manufacturing Innovation Institute

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NC Board of Science & Technology

www.nccommerce.com/scitech

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**NORTH
CAROLINA**

DEPARTMENT OF COMMERCE

NC Innovation Index

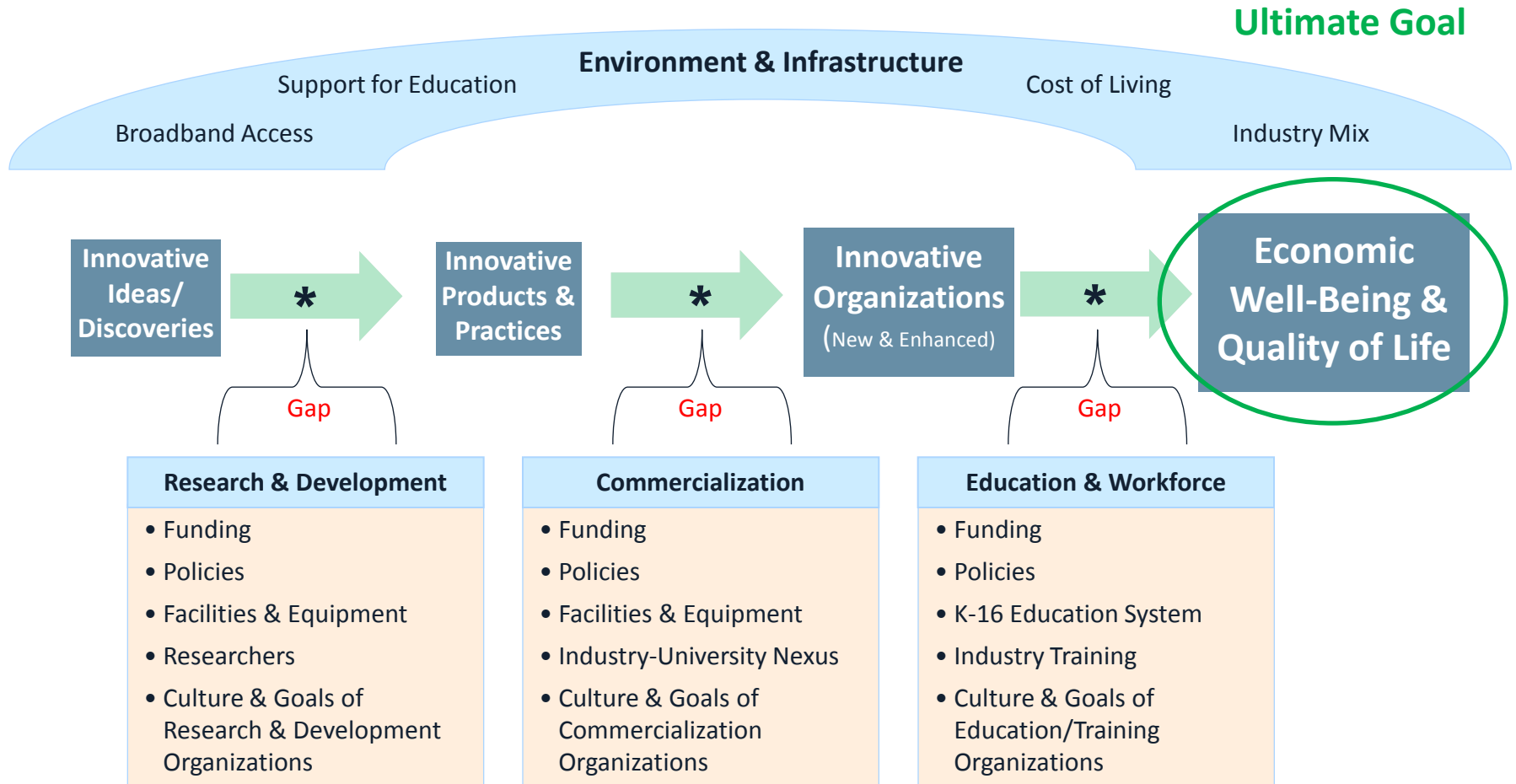
Innovation, Technology & the Economy

- Between one-third to one-half of economic growth in U.S. can be attributed to innovation *(Source: U.S. Department of Commerce 2012)*
 - *Innovation has big (5x) multiplier effect (across sectors & skill levels)*
(Source: Moretti 2013)
 - U.S. Bureau of Labor Statistics data show that in 70 of 71 high-tech occupations, median income exceeds median for all occupations
 - In 57 of these occupations, median income is 50% or more above overall industry median
-

Bottom line:

A high-productivity, high-employment,
high-income economy must be an
innovation-driven, high-tech economy

Innovation Ecosystem



Innovation Index

- Comprehensive measurement of ecosystem's health
- Several purposes:
 - Identify strengths & weaknesses
 - Inform decisions & policy making
 - Establish benchmarks & measure effectiveness
- A comprehensive & effective index should:
 - Focus on multiple components of innovation ecosystem
 - Include multiple measures for each component
 - Compare on multiple dimensions – spatially & temporally

Tracking Innovation

*North Carolina
Innovation Index
2013*



North Carolina Office of
Science & Technology

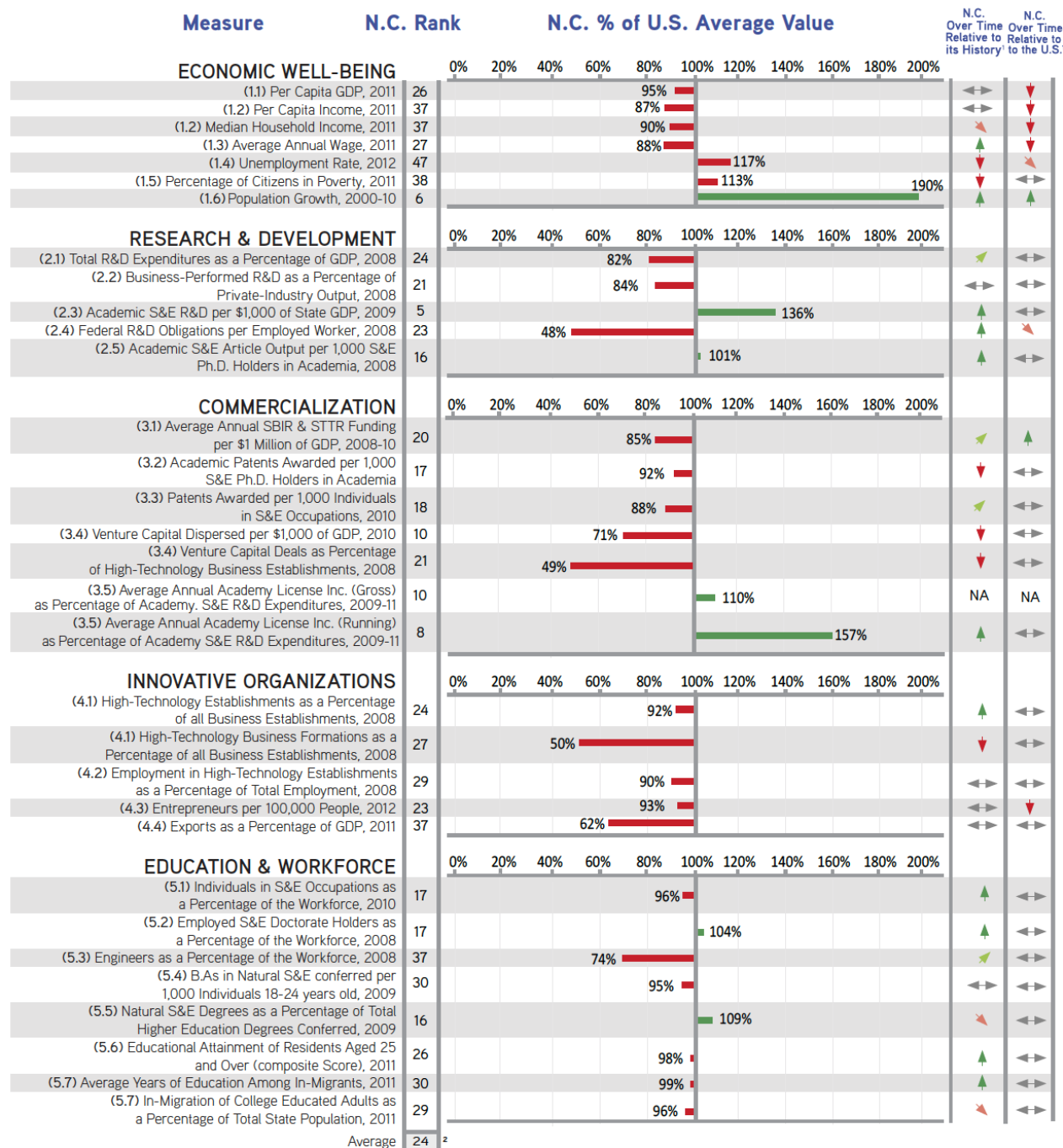
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***Summarized
Today:***

*A small
sample (5%)
of key
measures...*

Summary Findings

- NC's innovation ecosystem is moderately healthy (ranks 24th overall) & not improving much
- On 27 of 38 measures, NC's "Percent of U.S. Average Value" is below average, meaning NC underperforms nation overall
- Performance across indicators varies widely
- Innovation assets & activities are concentrated geographically (place matters)
- Need to understand state as a whole and differences across state
- **Strong potential** for increased innovation & commercialization



Dashboard Overview

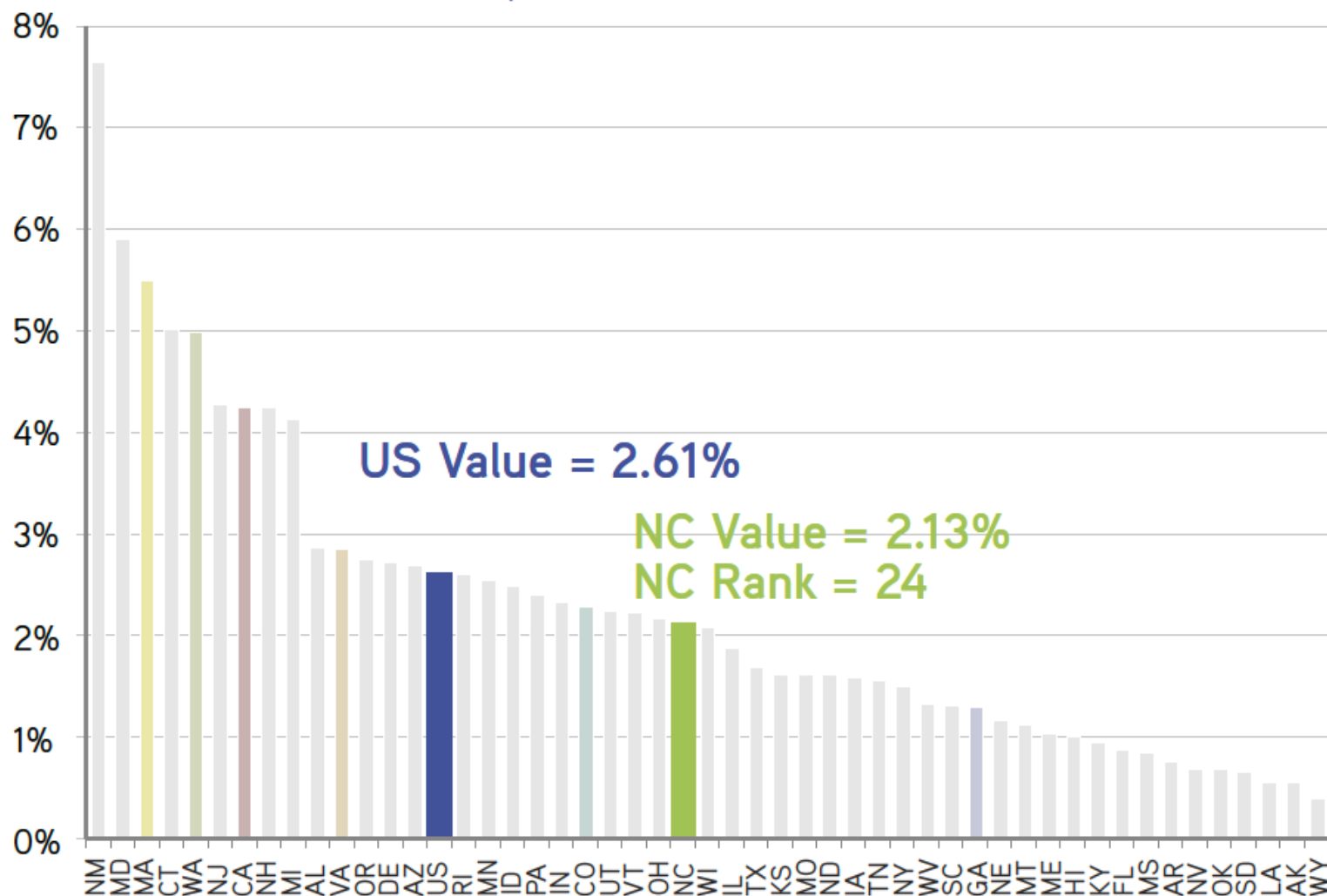
Red is bad

Green is good

Gray is neutral

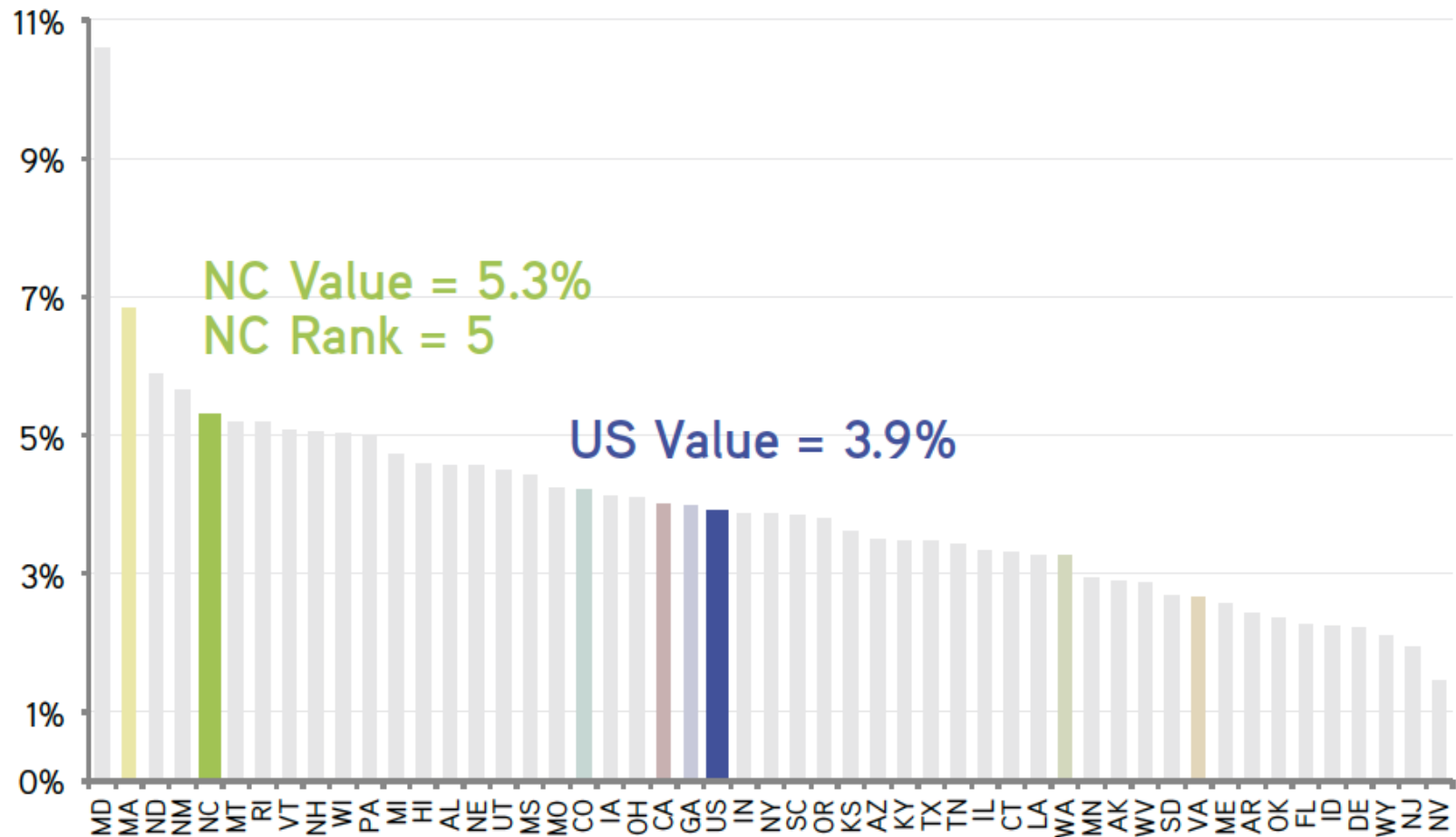
Selected Key Measures

2.1a - Total R&D Expenditures as a Percentage of GDP, All US States 2008



Source: National Science Board

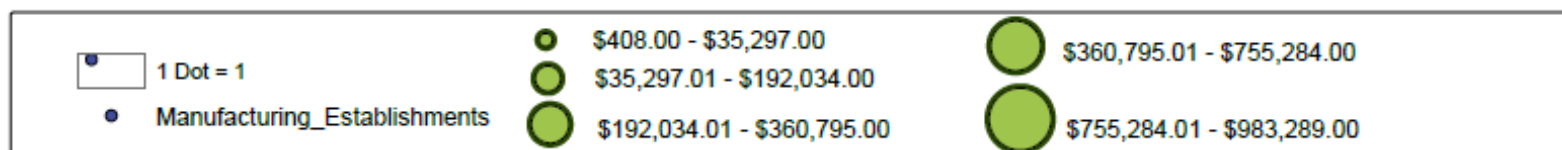
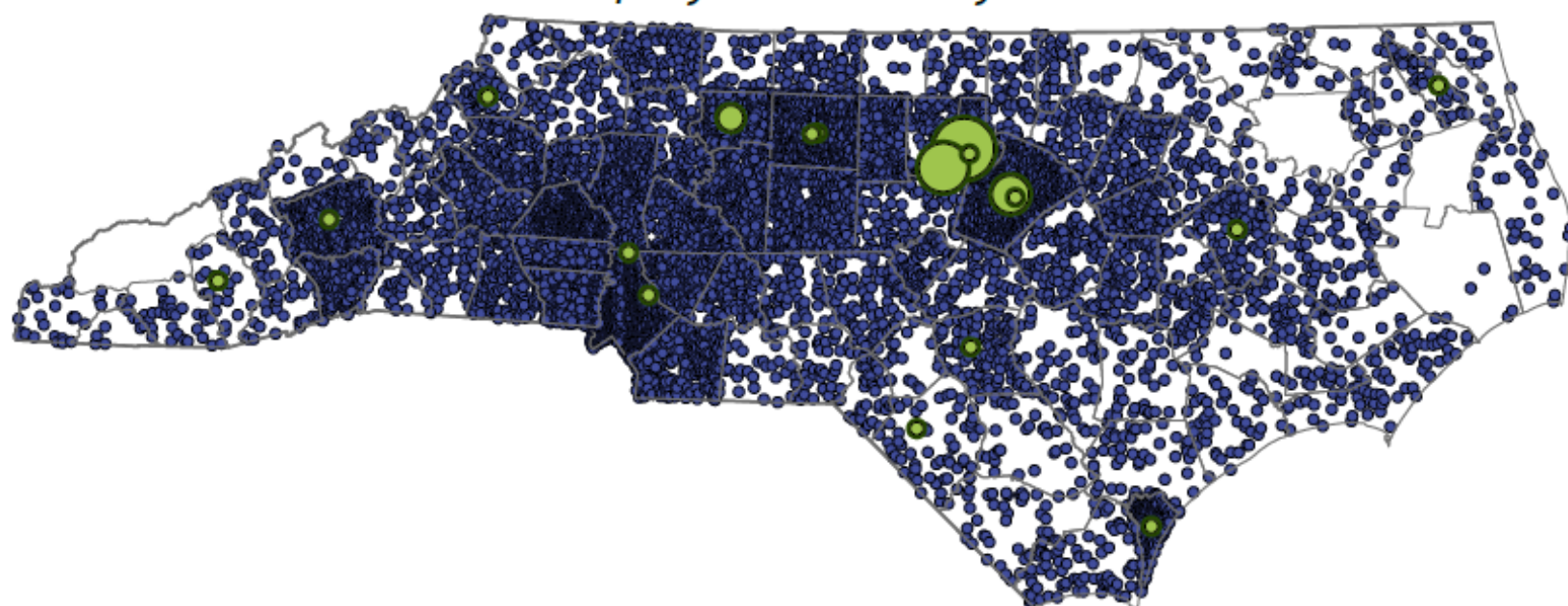
2.3a - Academic Science and Engineering R&D per \$1,000 of State GDP, All U.S. States, 2009



Source: National Science Board

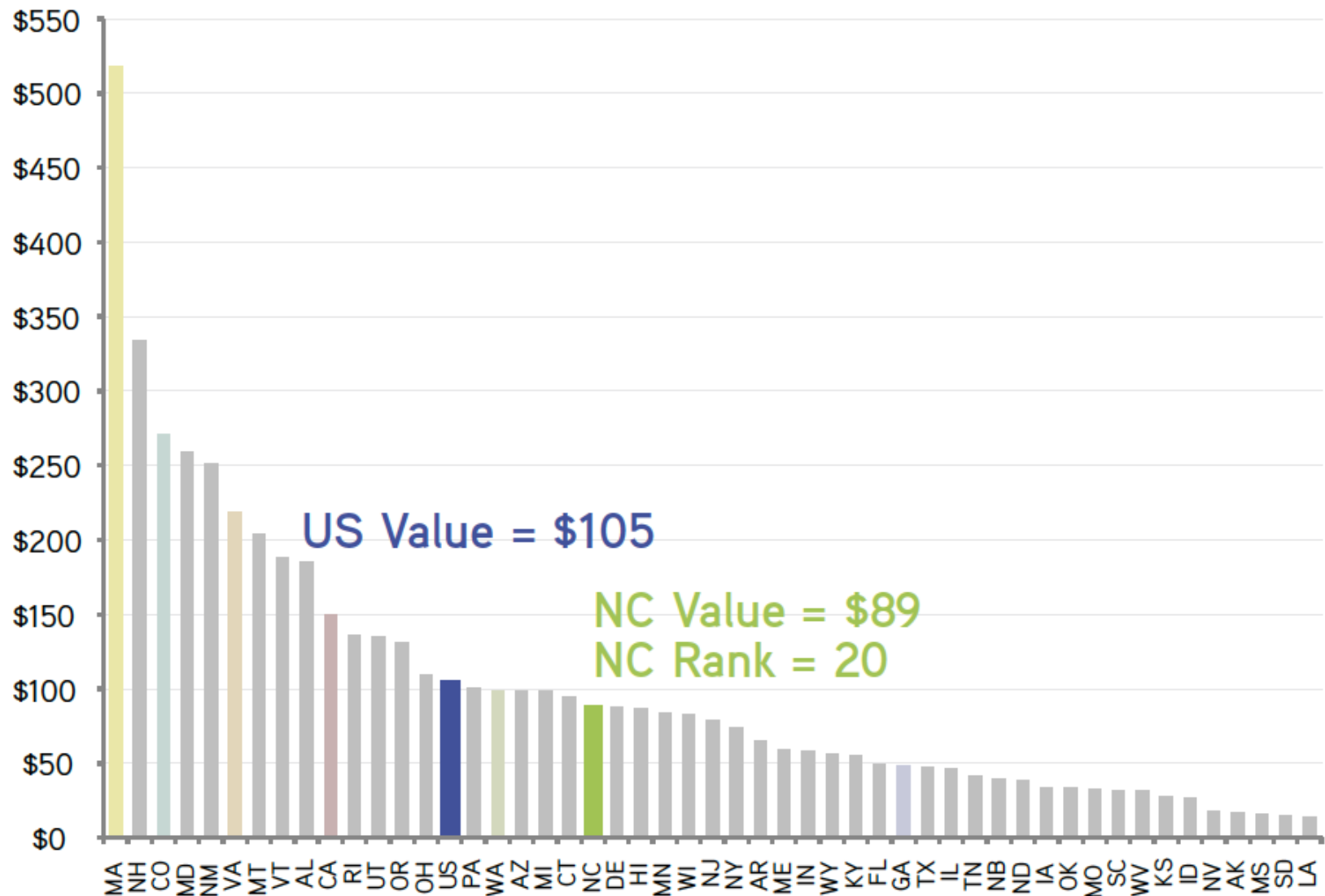
2.1e - Location of R&D Expenditures in North Carolina 2010

*Businesses establishments perform 73% of R&D in NC;
of that, Mfg. establishments perform 70%;
universities perform 23% of R&D in NC*

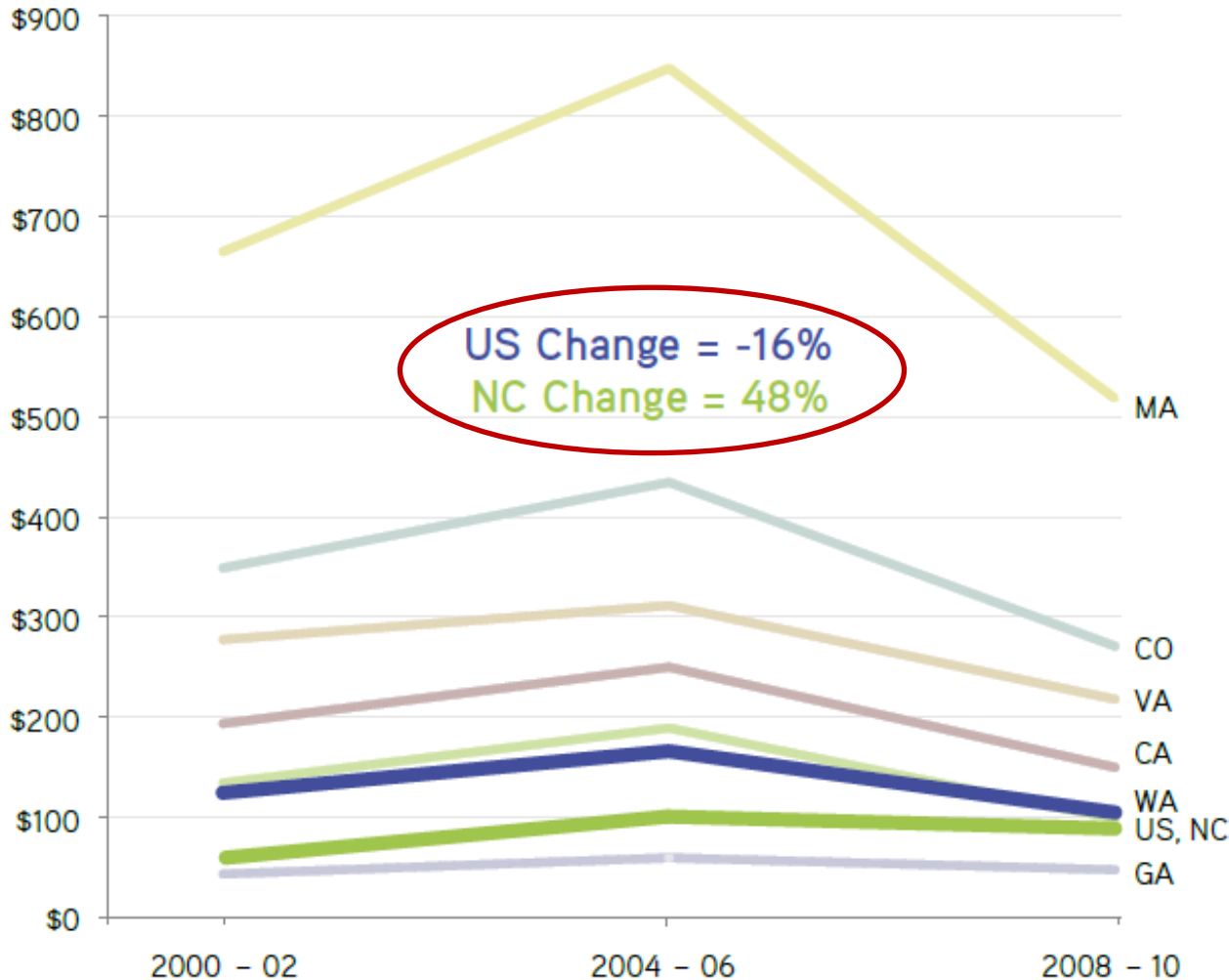


Source: QCEW, Labor and Economic Analysis Division, NCDoc

3.1a - Average Annual SBIR & STTR Funding per \$1 Million of GDP, All U.S. States, 2008-2010



3.1b – SBIR & STTR Funding per \$1M GDP, 2000-10



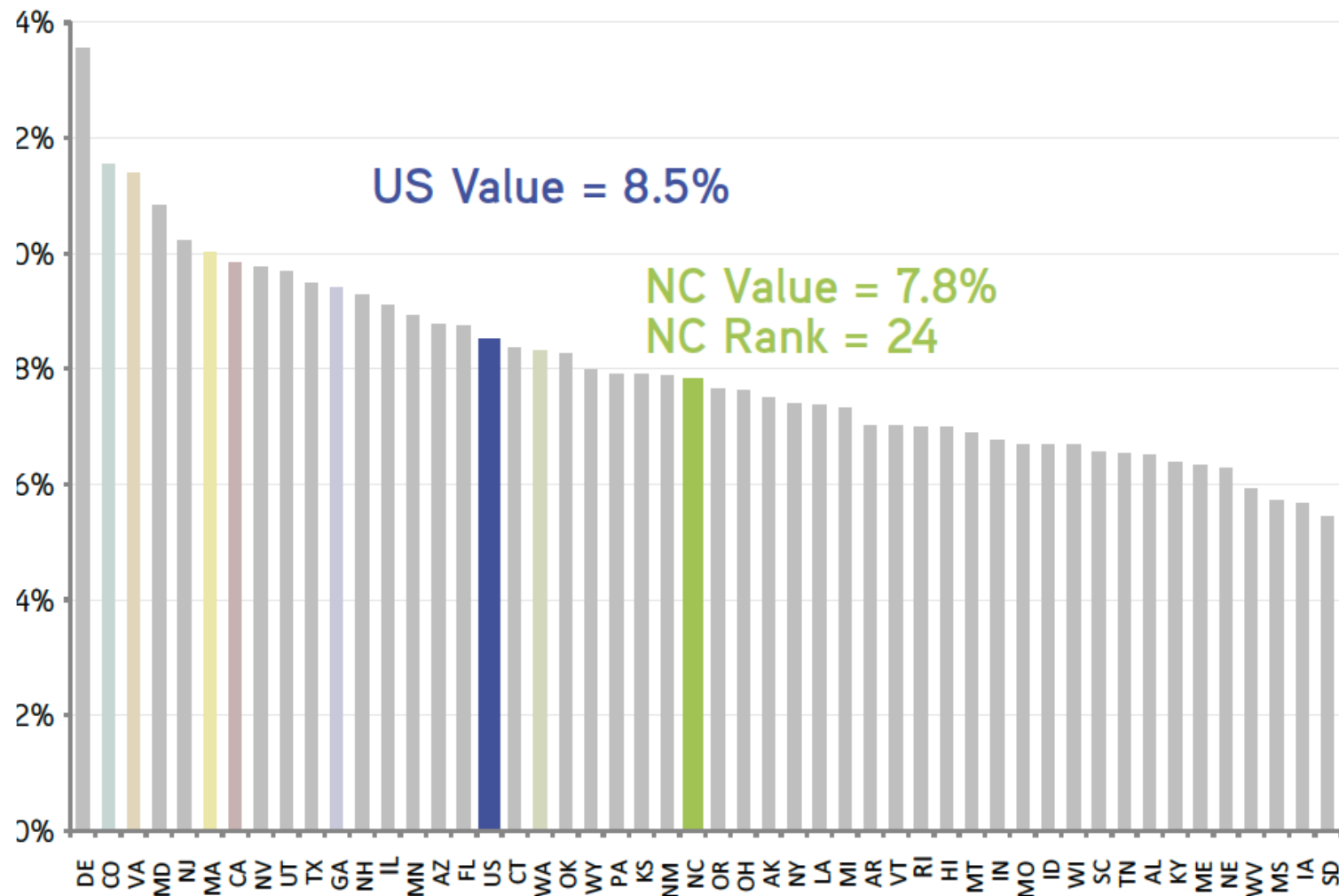
Trend:

NC's SBIR/STTR funding ratio increased faster than U.S. average and all comparison states

Reasons:

1. SBTDC's SBIR Program Specialist
2. One NC Small Business Program

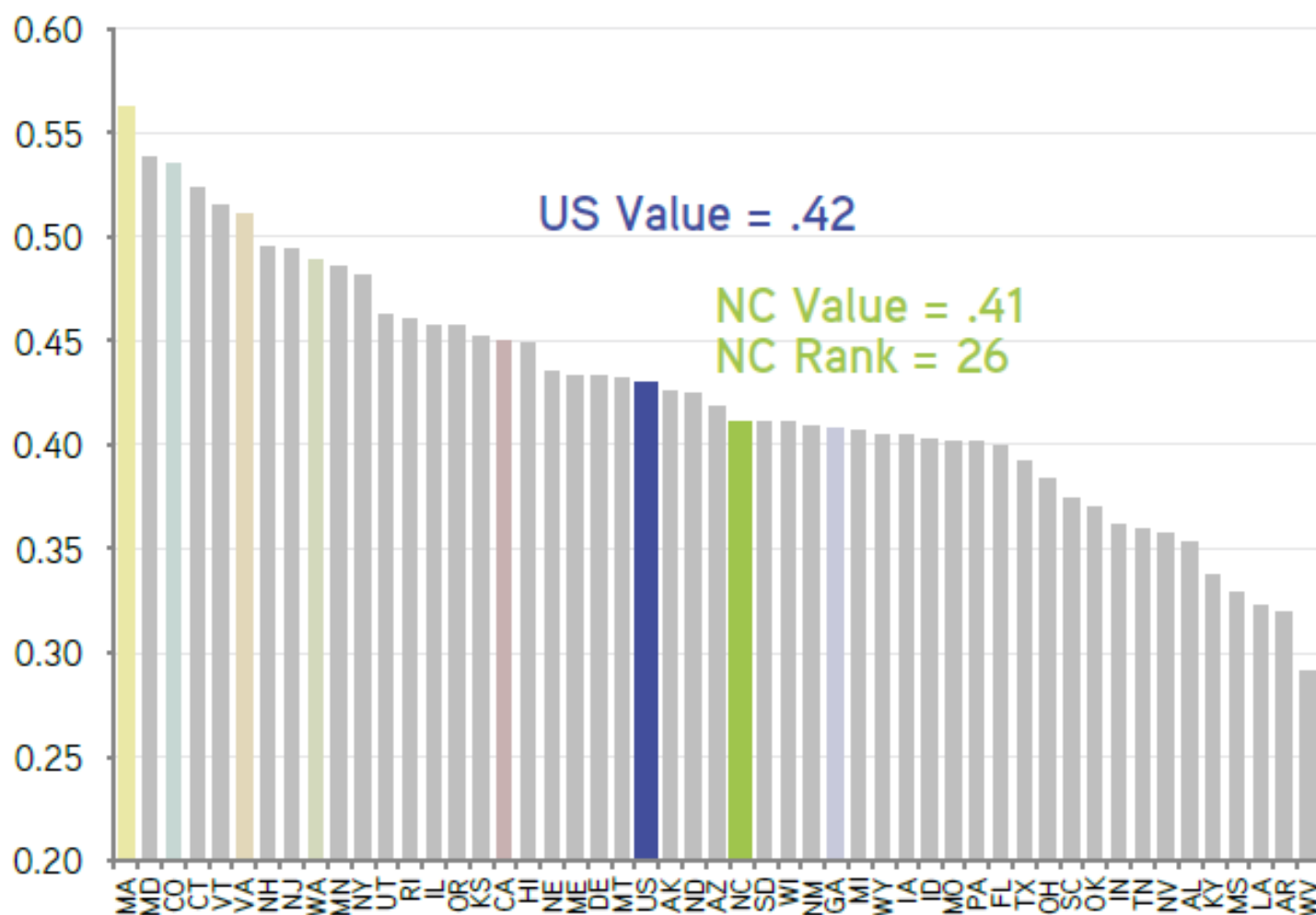
4.1a - High-Technology Establishments as a Percentage of Total Establishments, All U.S. States, 2008



Source: National Science Board

5.5a - Educational Attainment, All U.S. States, 2011

Weighted measure (composite score) of the education attainment of residents aged 25 years and over



Source: U.S. Census Bureau

Implications & Priorities

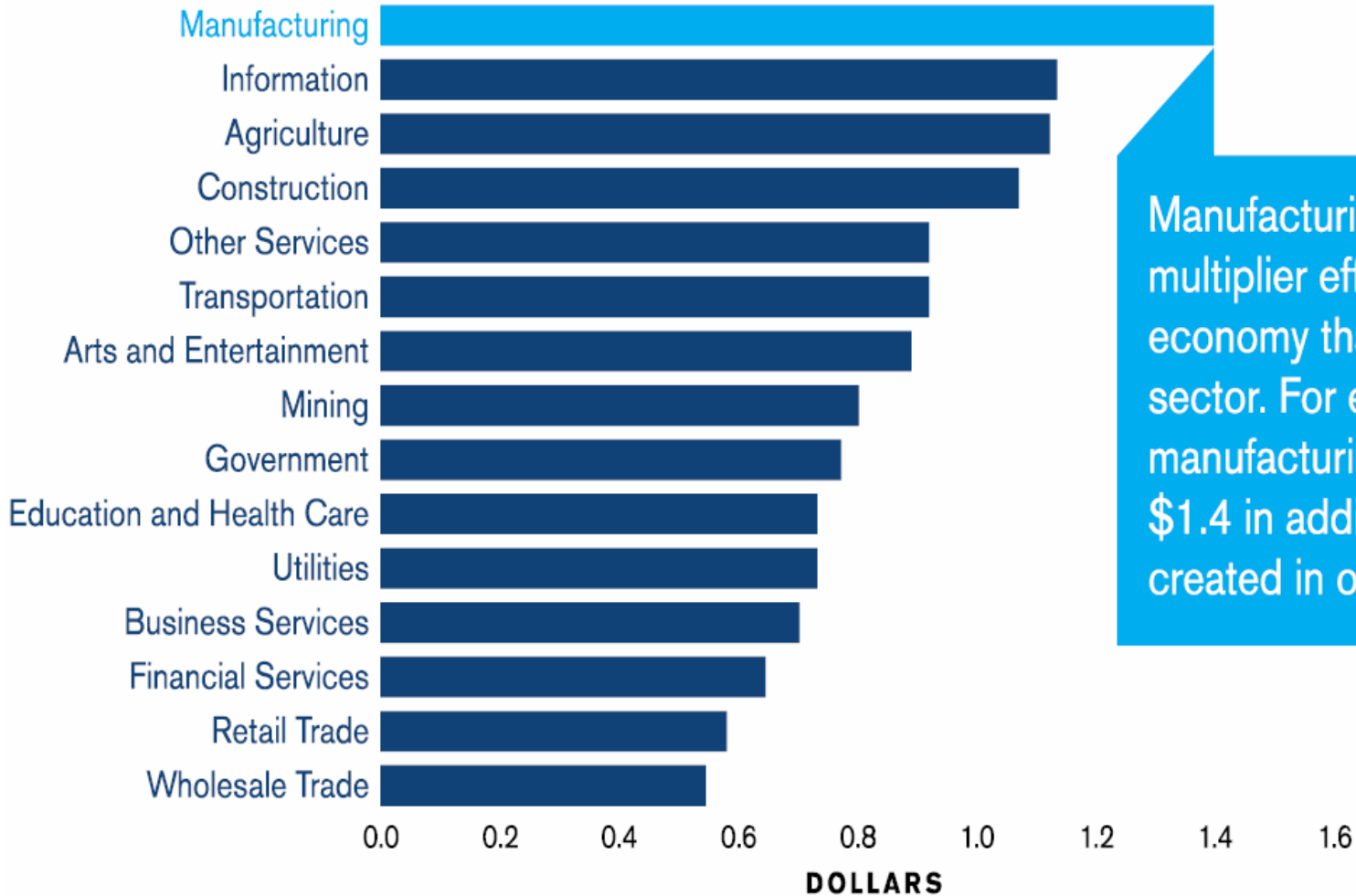
- **Research & Development** – Increase volume, intensity, & collaboration
 - **Commercialization** – Better leverage/fund strong asset base
 - **Innovative Organizations** – Boost entrepreneurship & business linkages
 - **Education & Workforce** – Emphasize STEM and strengthen core
-

Efforts must be:

- Sufficiently long-term and well-funded to make a difference
- Guided by clear benchmarks & performance criteria

***National Network for
Manufacturing Innovation
Program***

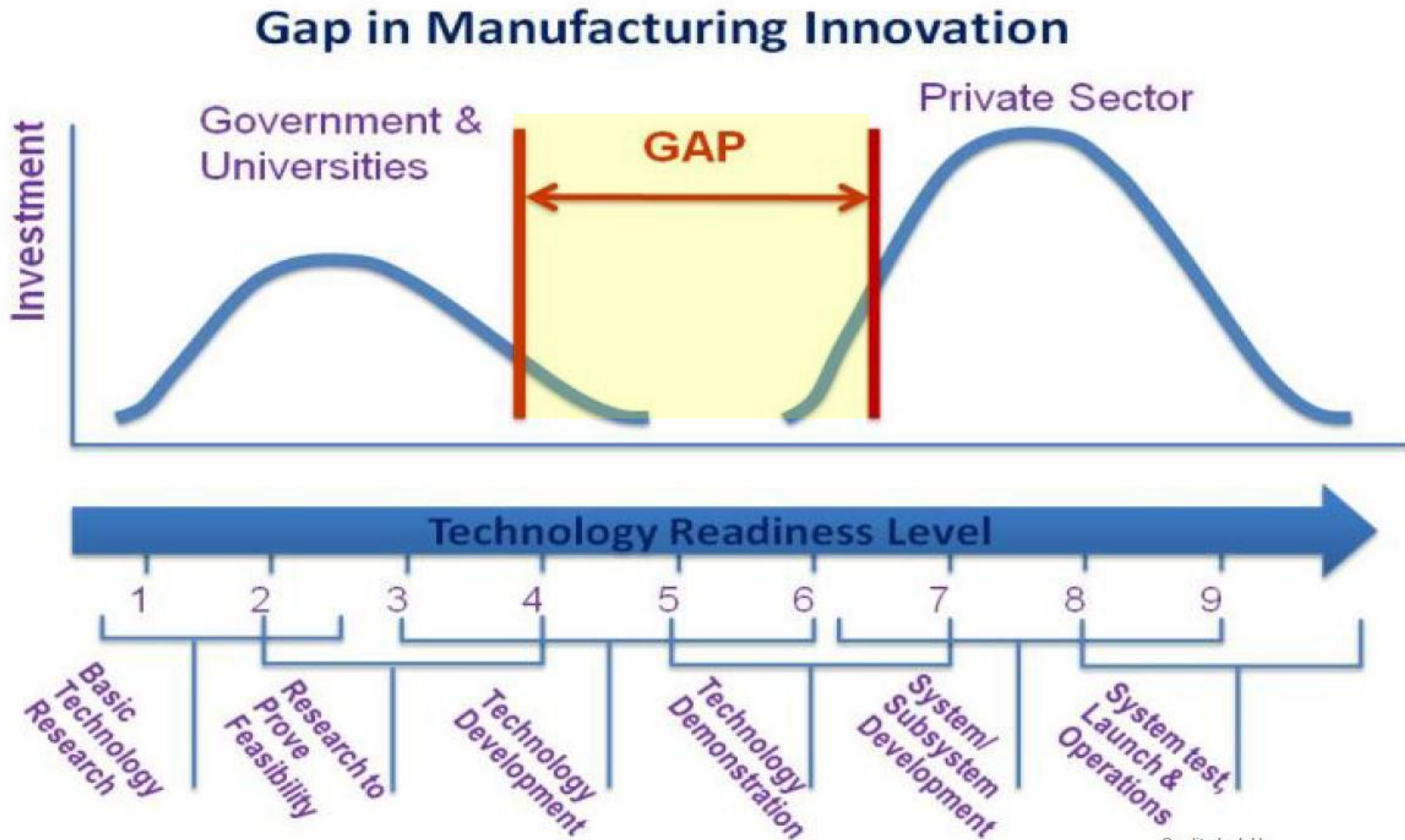
Manufacturing's Economic Impact



Manufacturing has a higher multiplier effect on the economy than any other sector. For every \$1 in manufacturing value added, \$1.4 in additional value is created in other sectors.

Manufacturing drives jobs and innovation impact

Manufacturing Scale-up Gap



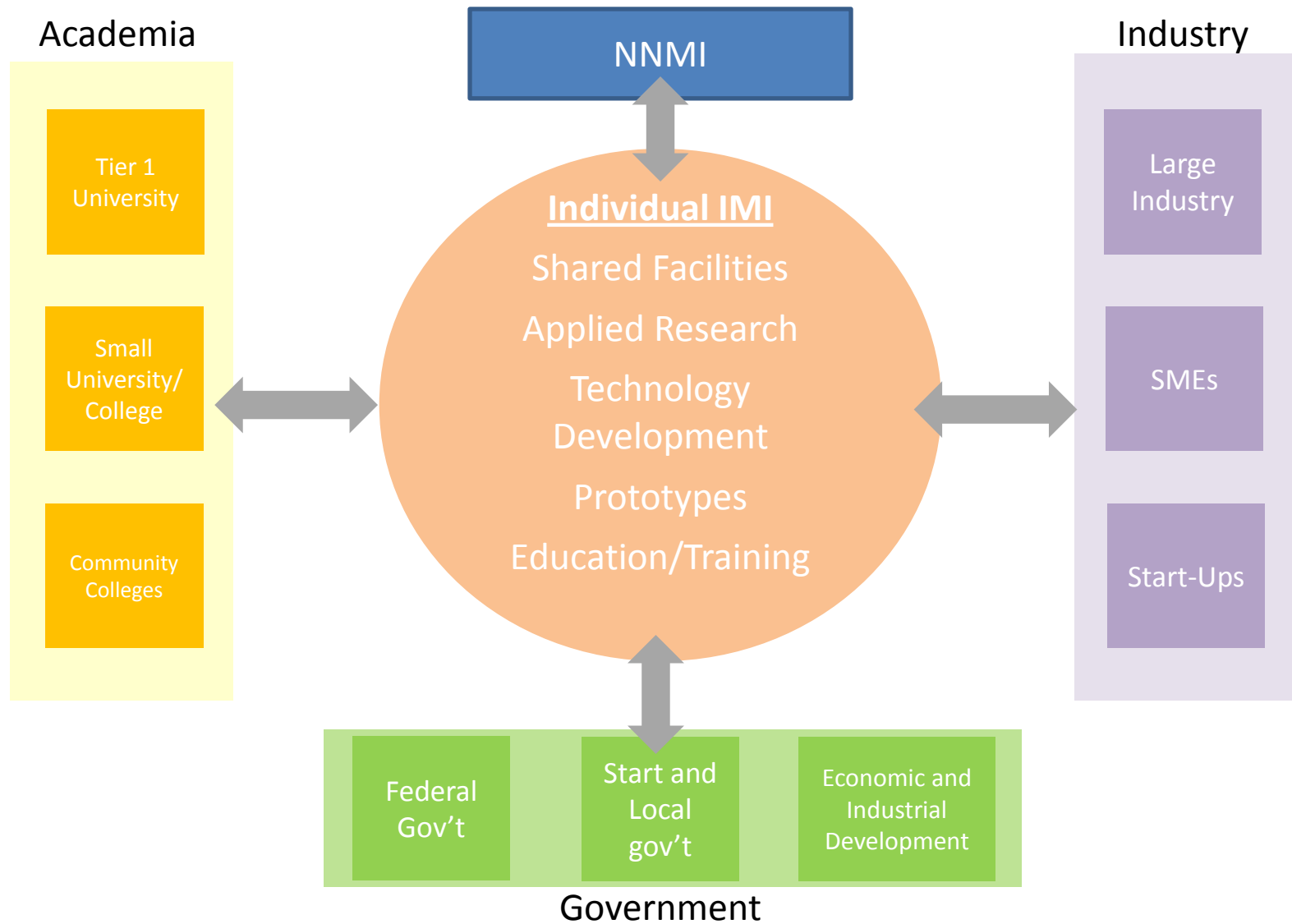
Institutes for Manufacturing Innovation (IMI)

- IMIs will offer **shared-use facilities** comprising an “industrial commons” (*the R&D, engineering, and manufacturing capabilities needed to turn inventions into competitive, manufacturable commercial products*)
- **Applied R&D projects** that **reduce the cost and risk** of developing and implementing new technologies in advanced manufacturing
- **Education and workforce training** at all levels
- Engagement with **Small-to-Medium Enterprises (SMEs)**
- **Regional, high-impact focus**, with history of technical strength

Attributes of each IMI

- **Partnership** between government, industry, and academia, supported with cost-share funding from federal and non-federal sources.
 - **\$70-120 million in total Federal funds over a 5-7 year timeframe**
 - Minimum **1:1 cost share (non-federal)** – can be cash, property, personnel, etc.
 - **Led by independent, not-for-profit institutions/universities** that strongly leverage industry consortia, regional clusters, and other resources
- **Must be sustainable (self-supporting)** moving forward

NNMI Network



NC STATE UNIVERSITY

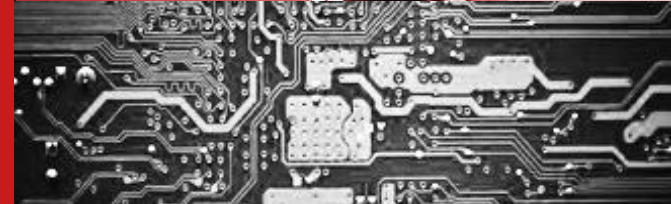
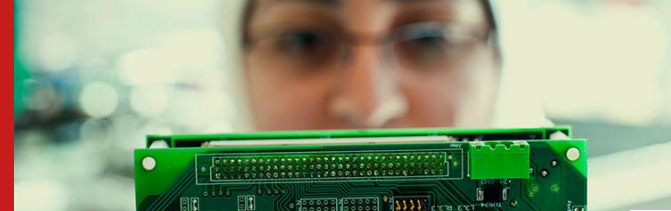
Next Generation Power Electronics Manufacturing Innovation Institute

Dennis Kekas

*Interim Executive Director,
Next Generation Power Electronics
Manufacturing Innovation Institute*



**U.S. DEPARTMENT OF
ENERGY**



Next Generation Power Electronics Manufacturing Innovation Institute



Vision: Wide bandgap technology for a more **energy efficient** world

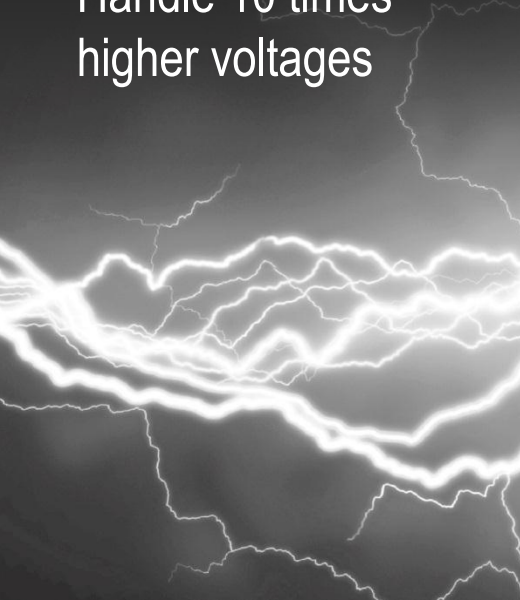
Mission: Develop a manufacturing-focused innovation ecosystem to reduce **cost**, improve **performance** and **reliability**, and enable U.S. **industry dominance** in WBG semiconductor devices and systems to create **jobs**



Operate above 300 °C compared to 150 °C for
Silicon-based devices



Handle 10 times
higher voltages

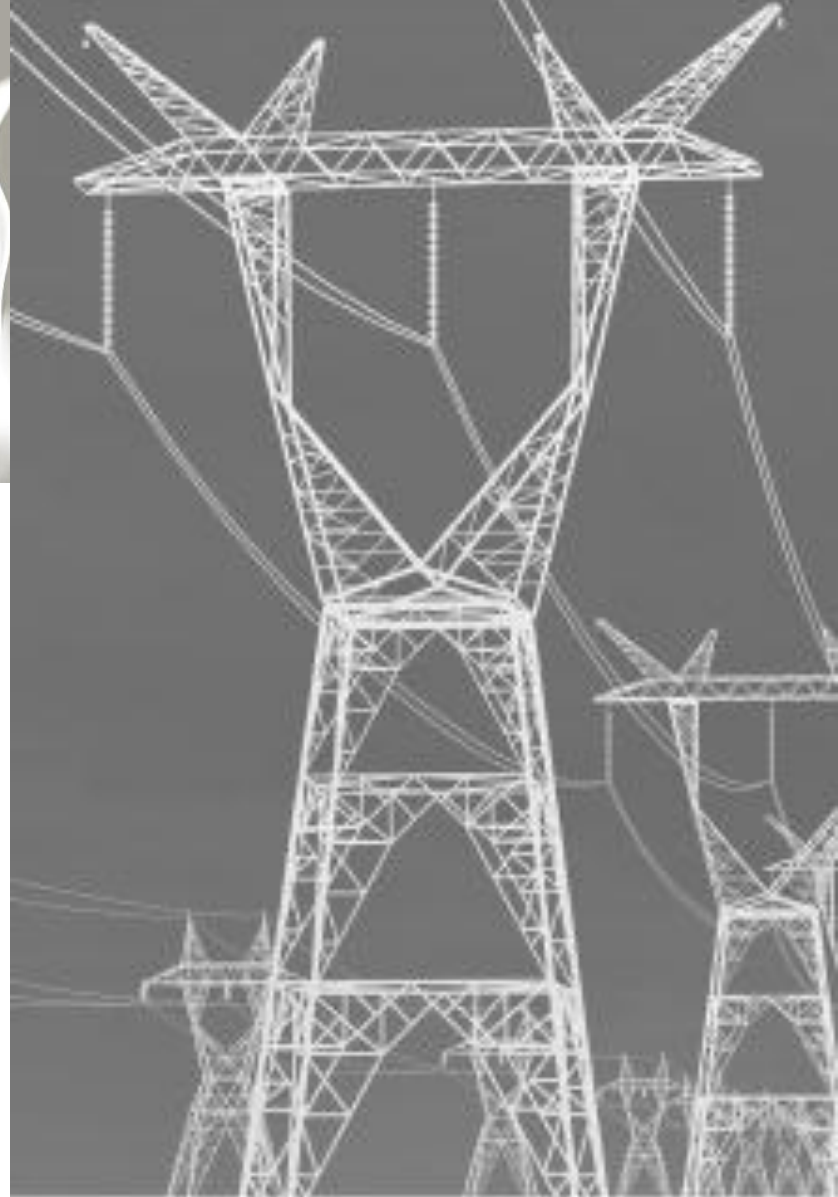


Produce bulbs with 10 times
more light that last 30 times
longer ...



saving \$250B by 2030

Reduce losses during DC-to-AC
electricity conversion by 90%



Founding Partners



U.S. DEPARTMENT OF
ENERGY

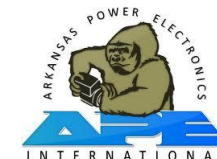
Wafer Suppliers



Design House /Device Manufacture



Device and Package Foundry



Power Electronics Companies



RD&D

NC STATE UNIVERSITY



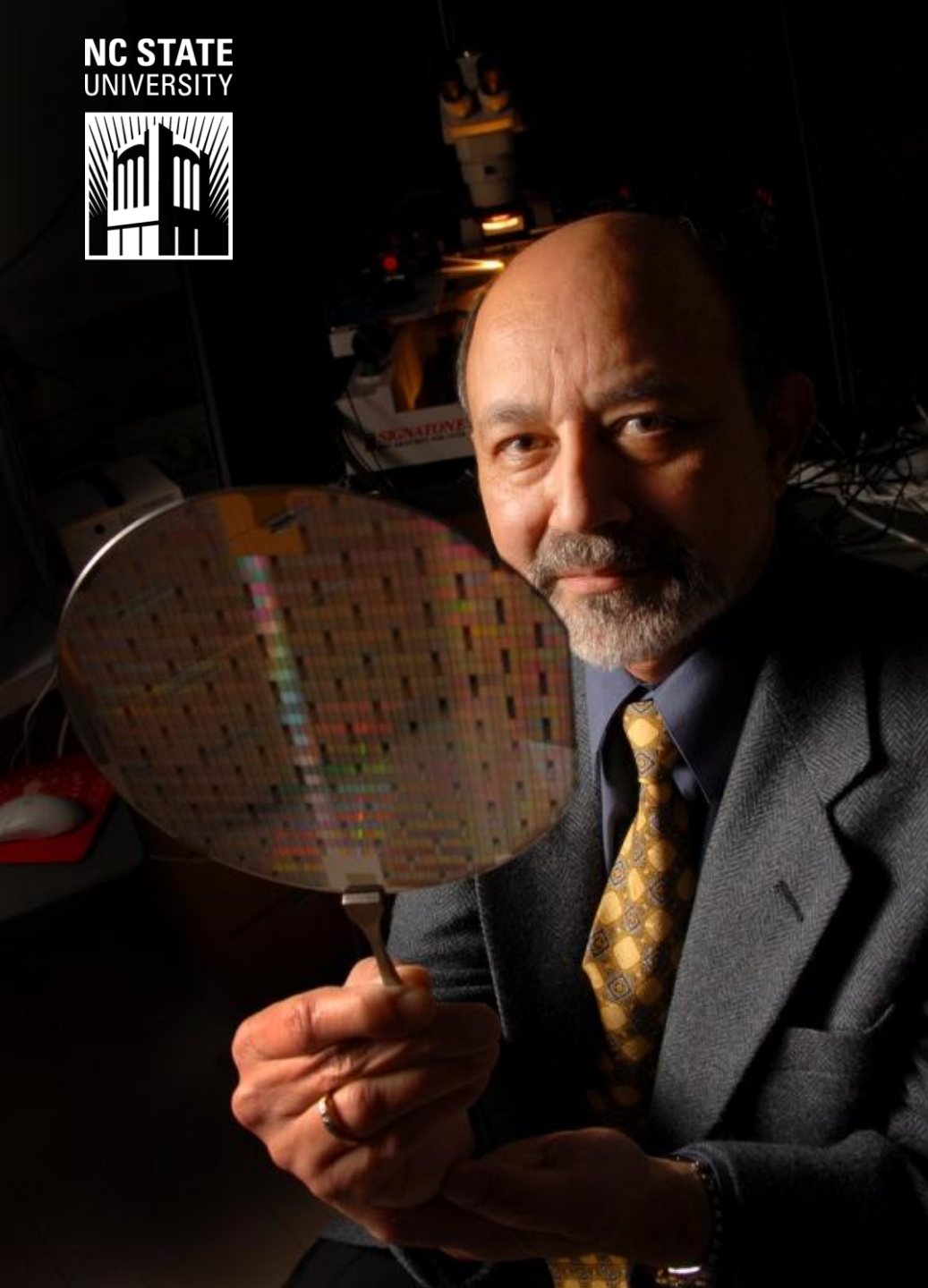
FLORIDA STATE UNIVERSITY



UNIVERSITY OF CALIFORNIA
SANTA BARBARA



NC STATE
UNIVERSITY



Why NC State?
Expertise



Why NC State?

Infrastructure



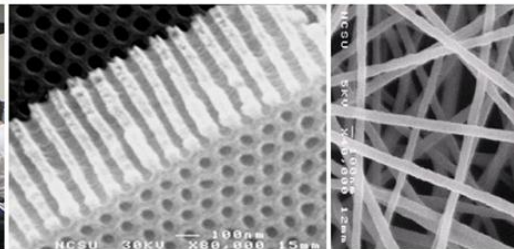
NC State's Centennial Campus



NCSU Nanofabrication Facility



Analytical Instrumentation Facility



Why NC State?

Industry Partnerships

NC STATE
UNIVERSITY



Centers & Institutes draw about 180 partners, including some of the top names in industry.



The miracles of science™



ExxonMobil

ABB



China Qianjiang Group



P&G



Kimberly-Clark

Johnson & Johnson



3M

BSN medical

EASTMAN



IOR



Itron

pgi